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project WILD

in Massachusetts

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A SAMPLER

Wild

is . . .

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project WILD

in Massachusetts

Project Wild in Massachusetts is a cooperative venture between the Massachusetts Division of Fisheries and Wildlife and the Massachusetts Audubon Society. Its purpose is to bring the rich resources of Project WILD to the teachers and youth leaders of the state.

Project WILD is curriculum supplementary materials that can be infused into a wide variety of instructional areas - materials that have been extensively tested in classrooms all over the country. Project WILD materials are in use in 44 states and across Canada and they are being adapted for use in a number of foreign countries outside North America.

WILD is an acronym for Wildlife In Learning Design and the project utilizes children's natural interest in wildlife to help them learn a wide variety of skills along with understanding of the relationships among people, wildlife, and the environment. To date Project WILD has developed three major collections of material:

* The Elementary Guide for Grades K- 8 [blue]
* The Secondary Guide for Grades 6-12 [orange]
* Aquatic WILD for Grades K-12 [blue & white]

There is considerable overlap of activities between the elementary and secondary guides. This is because school systems across the country vary so greatly in the grade ranges they include in each category. The first two volumes focus most heavily on terrestrial activities thus the aquatic version was created. This Sampler contains activities from all three volumes.

In addition to the national materials, Project WILD in Massachusetts provides a networking newsletter for teachers and youth leaders and has produced a coloring book and text specifically on Massachusetts wildlife. Project WILD in Massachusetts also has chosen the river otter as its symbol and this charming animal appears on the cover of this sampler and the masthead of the newsletter.Fun loving, this animal is an appropriate symbol with its involvement in both terrestrial and aquatic systems.

Project WILD materials can only be obtained by participating in a six-hour minimum workshop. The materials are not for sale. A trained corps of facilitators, who have participated in a minimum 12 hour training program, provide the workshops across the state. Workshops may be offered regionally or be given to a particular school or school system. The materials in this sampler are duplicated directly from the Project WILD books and thus represent accurately the format and approach of Project WILD activities. We hope you will find them intriguing and will consider aquiring your own full set through a complete workshop in the near future.

PREFACE

Project WILD is an interdisciplinary, supplementary environmental and conservation education program emphasizing wildlife.

For instructional purposes in Project WILD, wildlife is defined as any non-domesticated animal. Wildlife may be small organisms only visible to people if seen through a microscope, or as large as a great blue whale. Wildlife includes, but is not limited to, insects, spiders, birds, reptiles, fish, amphibians, and mammals, if non-domesticated.

Project WILD's primary audience is teachers of kindergarten through high school students. This does not limit the usefulness of the Project to formal educational settings, however. Volunteers working with young people in pre-school and after-school programs; representatives of private conservation, industry, and other community groups who are interested in providing instructional programs for young people or their teachers; and personnel involved in preparation of future teachers are all among those who effectively use the instructional resources of this program.

Project WILD is based on the premise that young people and their teachers have a vital interest in learning about the earth as home for people and wildlife. The program emphasizes wildlife—because of its intrinsic, ecological, and other values, as well as its importance as a basis for understanding the fragile grounds upon which all life rests. Project WILD is designed to prepare young people for decisions affecting people, wildlife, and their shared home, earth. In the face of pressures of all kinds affecting the quality and sustainability of life on earth as we know it, Project WILD addresses the need for human beings to develop as responsible members of the ecosystem.

The goal of Project WILD is to assist learners of any age in developing awareness, knowledge, skills, and commitment to result in informed decisions, responsible behavior, and constructive actions concerning wildlife and the environment upon which all life depends.

Project WILD is a joint project of the Western Association of Fish and Wildlife Agencies (WAFWA) and the Western Regional Environmental Education Council (WREEC). These two organizations are the primary sponsoring agencies.

The Western Association is a group comprised of the directors of the state agencies in 13 western states who are responsible for management of wildlife in their respective states.

The Western Regional Environmental Education Council is a not-for-profit corporation comprised of representatives of the state departments of education and state resource agencies in 13 western states.

Agreements between these two sponsoring organizations allow for additional sponsorship by other interested organizations and agencies.

The WILD Steering Committee, staff, WREEC, WAFWA members, and all associate organizational and state sponsors as well as others associated with the program are dedicated to achieving the highest possible standards of professional quality, factual accuracy, and objectivity in all programs, activities and materials bearing the WILD name. The Project WILD Steering Committee has adopted policies and guidelines which state Project WILD's commitment to neutrality on controversial issues, treating such issues fairly and honestly without advocating any one particular point of view, recognizing that people need information from a variety of sources to make their own informed decisions. Project WILD programs, activities, and materials are not to be used to promote agency or organizational policies or political points of view.

Associate and Contributing Sponsorship

It is possible for an agency or organization to become an associate or contributing sponsor of Project WILD, with appropriate credit given for that organization's involvement in the program. Each revision of the project materials will reflect the complete list of sponsors.

For Additional Information

For additional information about participation in Project WILD as an associate or contributing sponsor, please contact the Project WILD Steering Committee or the Project Director.

For information about Project WILD's availability in Canada, please contact the Canadian Wildlife Federation, 1673 Carling Avenue, Ottawa, Ontario, Canada T5K 2G6.

INTRODUCTION

A concern for the land and its resources is basic to our survival, both as individuals and as a nation, for we cannot live apart from our planetary home. Environmental quality and human health and well-being are interdependent.

What will our land be like 20, 40, or 100 years from now? No one can really be certain, but the trends are there, and we are gaining in our knowledge of environmental cause and effect. We can be sure, however, that our environmental future is to a large degree in our hands. We have our technologies, and we are gaining in our ability to manipulate the physical environment and its resources—for better or for worse. The directions we take with our technologies are very much dependent upon the values we hold and the choices we make, individually and socially.

Two elements of society play key roles in shaping future environments: resource management and education. Both are concerned with the future. The goal of education is the highest and best use—or conservation—of the human resource. The goal of resource management is the highest and best use—or conservation—of natural resources. These goals are interdependent.

Project WILD is a joint effort involving representatives of these two key elements of society to do something together which might have a beneficial effect on future environments as well as on the lives and well-being of humans and wildlife who will share them. Much has been accomplished thus far; much remains to be done. The commitment is there, however, and steady progress is being made. How might we describe what has been accomplished thus far?

Some might say that Project WILD is an excellent set of teaching materials bound in an attractive format. Professional educators could describe these materials as a supplementary, interdisciplinary, educational program directed at providing learning experiences for students in kindergarten through grade twelve. WILD is these things, and more. These descriptions fall short of capturing the essence of the program. Quite simply, Project WILD is people—educators, resource managers, citizen conservationists, and others—doing something together which they believe is important for children, and for the land and its resources, now and for the future.

The prime movers in Project WILD were resource management professionals and education administrators with state-level responsibilities from 13 western states working through the Western Regional Environmental Education Council (WREEC) and the Western Association of Fish and Wildlife Agencies. These people put together the basic concept and plan of action for the program and secured the necessary resources to get it underway. Organizationally, WREEC is responsible for the materials and program development, while the Western Association provides technical expertise and program resources. Other agencies and organizations have since joined as cosponsors, and have an input into the direction of the program through the joint WREEC/Western Association Steering Committee for Project WILD.

WREEC has provided a means for its members to develop and coordinate state-level conservation and environmental education programs on a regional basis for the last 16 years. The organization began as a federal project through a U.S. Office of Education grant in 1970, and became an independent nonprofit educational corporation in 1976.

One of the most visible accomplishments of WREEC is Project Learning Tree (PLT), also a supplementary, interdisciplinary educational program for educators working with students in kindergarten through grade twelve. Project Learning Tree was produced through a grant from the American Forest Institute, and is cosponsored by WREEC and the American Forest

Foundation. Now in use in more than 40 states and four Canadian provinces. Project Learning Tree provides materials and support services. The Project to date has provided instruction and materials for more than 100,000 teachers and youth leaders—with an emphasis on effectively teaching youngsters about forest resources and our interdependence with the natural world.

The experience gained over ten years of working with Project Learning Tree proved to be of great value in developing Project WILD. The same general procedure was followed in developing the materials. A content outline or framework was developed cooperatively with input from a great number of people—educators, preservationists, conservationists, wildlife managers, business and industry representatives, and others. The basic materials to teach the concepts in the outline were developed by teachers in five writing workshops held in western states, and were extensively field-tested and edited before being assembled in final form. As with Project Learning Tree, the materials will be available to those who attend instructional workshops to be offered by staff-trained leaders. In the sponsoring states, the fish and wildlife agencies typically will be responsible for the statewide implementation program, working with the state education agency, citizens groups, local school personnel, and others. Follow-up activities, evaluation, revision of the materials, and other staff services will be offered through WREEC for the forseeable future.

As with all good teaching materials, Project WILD is concerned with providing information and helping students evaluate choices and thereby make reasonable decisions. In short, our mission is to help youngsters learn **how** to think, not **what** to think.

In an effort to assure objectivity, WREEC retained editorial control over the entire project. Decisions are made by a Project WILD Steering Committee, with representation from both WREEC and the Western Association of Fish and Wildlife Agencies. Associate sponsors may attend and participate in all Steering Committee meetings, but have no vote. We are proud of the fact that our strict efforts at balance and objectivity, as well as the technical validity and educational value of the materials, have gained sponsors for the project from a number of organizations representing a wide range of views on wildlife and its management.

As noted, Project WILD is a people program. Its overall purpose is to motivate youngsters to take intelligent and constructive action to conserve wildlife and natural resources. Much has been accomplished so far: framework and materials produced, field testing and evaluation completed, implementation plans developed and initiated. However, the process will not be complete until the learning activities reach a significant number of youngsters—in classrooms, through youth groups, and as individuals.

That is why we consider you—the person now reading this volume—to be so important. You are a key part of the people process, and it is you who must take WILD on the next step in its journey to the youngsters. We will help you all we can, but the final success of the program depends upon your skill in using these materials and resources. And, in so doing, you become part of us—and we become part of you: people who care about children, about our land and its resources, about the present and the future, and who are willing to do something about it.

Welcome to Project WILD!

Rudolph J.H. Schafer

Western Regional
Environmental Education Council

HOW TO USE THIS BOOK

Thanks for your interest in Project WILD! Project WILD has been designed to be an instructional resource for people who care about natural resources and the environment—beginning with the recognition that the earth is home for people and wildlife.

A Supplement to Existing Courses and Programs

Instructional activities within the Project WILD materials are designed for easy integration into school subject and skill areas—especially science, social studies, language arts, mathematics, and art—so that classroom teachers may use the materials as a means by which to teach required concepts and skills. . . at the same time teaching about people, wildlife, and the environment. Educators in non-school settings, such as scout leaders, outdoor education camp personnel, park naturalists, and others also find the materials of use.

Instructors may use one or many Project WILD activities. The activities may be integrated into existing courses of study, or the entire set of activities may serve quite effectively as the basis for a course of study.

Organization of the Materials

Because these materials are supplementary—designed for integration into existing courses of study—instructors may pick and choose from the activities. Each activity is designed to stand alone, without other Project WILD activities. There is no need to do the activities in order, nor to do all activities, even for a given grade level. However, the activities have been placed in a thematic and developmental order that can serve as an aid to their use. They are organized to allow students to acquire knowledge, information, and skills to assist them in making informed and responsible decisions affecting wildlife, people, and our shared environments.

The activities are organized into seven major sections, corresponding to the Conceptual Framework which can be found in the back of this guide. By looking at the Table of Contents—or reading the Conceptual Framework—you can see the conceptual development: from awareness and appreciation . . . to responsible human actions. The sections are:

Section One: Awareness and Appreciation
Activities in this section are introductory. They are designed to establish a foundation for most of the activities which follow. For example, beginning the school year or an instructional unit involving wildlife with either "What's Wild" or "Animal Charades" establishes a definition of wildlife, and distinguishes between wild and domesticated animals. Other activities in this section examine similar survival needs of people, domesticated animals, and wildlife, including a basic introduction into the components of habitat.

Section Two: Diversity of Wildlife Values
Activities in this section provide students an opportunity to consider the range of contributions by wildlife to people and the environment—including aesthetic, ecological, scientific, political, commercial, economic, recreational, and intrinsic values.

Section Three: Ecological Principles
Activities in this section provide a good foundation for understanding the characteristics of environments, how they work, who and what inhabits them, and specific implications for understanding these principles as they affect wildlife. If the students have limited or no background in ecological principles, it is best to select a few introductory activities from Sections One and Three before tackling some of the more complex activities found in later sections of the Project WILD materials.

Section Four: Management and Conservation
This section builds on the general principles established in Sections One and Three, and provides an opportunity for more depth in understanding how wildlife and other natural resources can be managed and conserved.

Section Five: People, Culture, and Wildlife
The major emphasis of activities in this section is to examine the influence of ways that human cultures affect people's attitudes toward and treatment of wildlife and other natural resources—from music to advertisements to cartoons and bumper stickers.

Section Six: Trends, Issues, and Consequences
Activities in this section are most effective when students have some background in wildlife and ecological principles. A range of difficult issues is addressed. Students are given opportunities to apply knowledge they have gained in earlier activities by consideration of difficult issues and their consequences.

Section Seven: Responsible Human Actions
Activities in this section are designed to serve as a way for students to recognize, evaluate, and make responsible choices in their own lives—reflecting the knowledge and skills they have acquired in earlier activities. Solutions are not prescribed for students. Instead, students are provided opportunities to consider and take constructive actions as thoughtful, informed, and responsible inhabitants of our shared home.

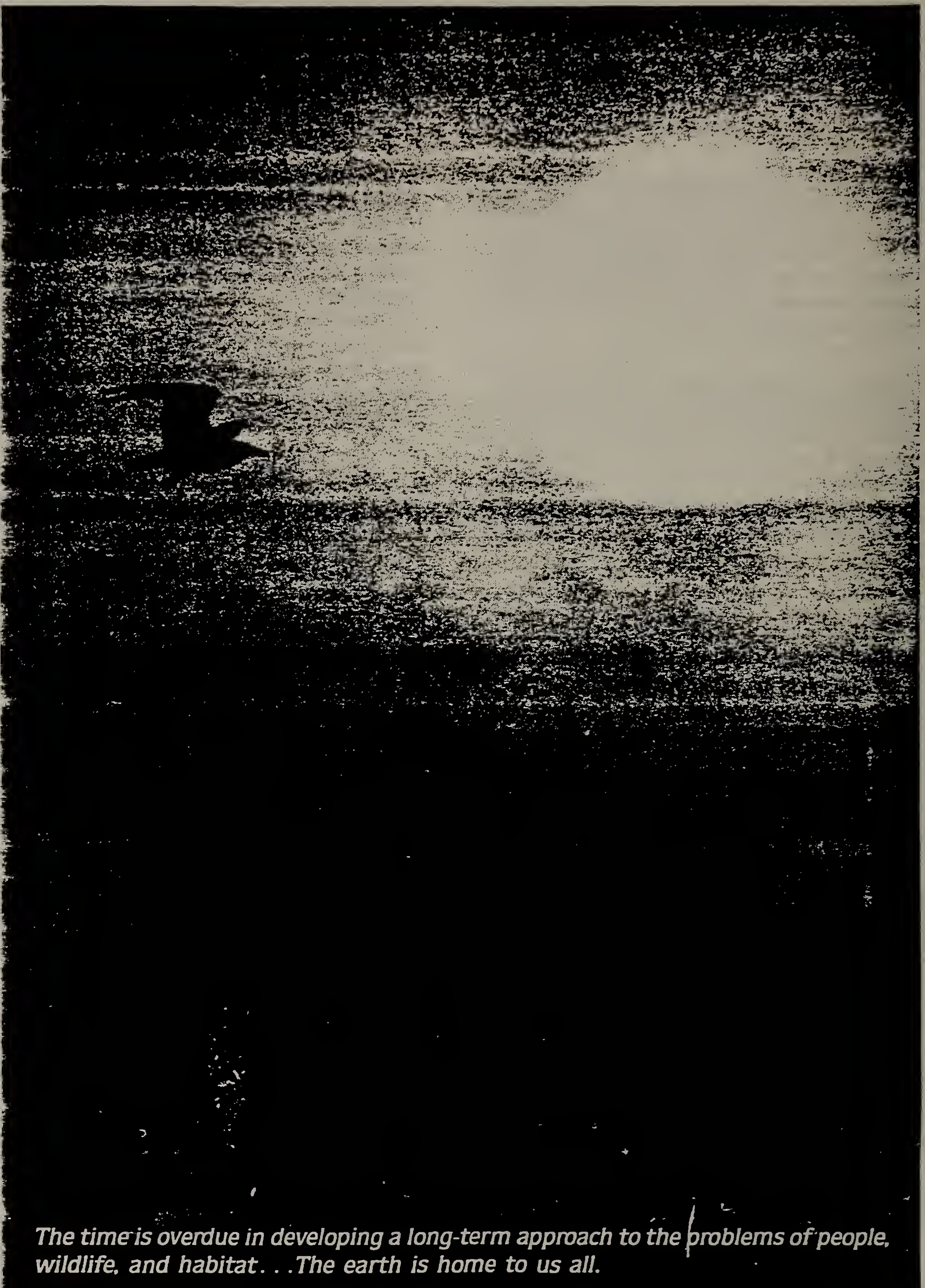
Organization of Each Activity

Each activity includes a statement of the instructional objective; a brief description of the instructional method employed; background information for the instructor; a list of any materials needed; step by step procedures; a few limited examples of ways in which to evaluate student learning; indication of recommended grade level, subjects from which concepts are drawn, skills, duration, recommended group size; setting (indoors or outdoors); and key vocabulary. In every case, an instructor is encouraged to adapt activities for different ages, subjects, skills, group sizes, etc. Finally, each activity includes a listing of points in the Conceptual Framework outline to which the activity either corresponds directly, i.e., the activity is designed to teach the concepts specifically; or, indirectly, i.e., the points noted are useful additional background information for the instructor.

Appendices

The Appendices include a list of agencies and organizations which are referenced in one or more Project WILD activities; a glossary of terms for use by the instructor; a complete listing of the Conceptual Framework in outline form; an alphabetical listing of activities by title; a set of guidelines for study of live animals in classrooms; and cross references by subject area, skills, grade levels, and topics for use in creating instructional units.

We hope you find these materials of use. Let us hear from you at any time with suggestions as to how to improve them, requests for additional information and assistance—and any news of your experiences and those of your students as you "do something WILD!"



The time is overdue in developing a long-term approach to the problems of people, wildlife, and habitat. . .The earth is home to us all.

TABLE OF CONTENTS

Preface vii
Introduction viii
How To Use This Book x
Table of Contents xiii

SECTION ONE: AWARENESS AND APPRECIATION

What's Wild? 1
Animal Charades 3
Bearly Born 5
Ants On A Twig 9
Color Crazy 11
Interview A Spider 13
Grasshopper Gravity! 15
Wildlife Is Everywhere! 19
Microtrek Scavenger Hunt 21
Stormy Weather 25
The Beautiful Basics 29
Everybody Needs A Home 31
Habitat Lap Sit 33
Habitracks 35
What's That, Habitat? 39
Habitat Rummy 41
My Kingdom For A Shelter 47
What's For Dinner 49
Litter We Know 51
Tracks! 55

SECTION TWO: DIVERSITY OF WILDLIFE VALUES

Wild Words. . . A Journal-Making Activity 59
Animal Poetry 63
Museum Search For Wildlife 65
Let's Go Fly A Kite 67
Eco-Enrichers 69
Seed Need 71
Environmental Barometer 73
Make A Coat! 75

SECTION THREE: ECOLOGICAL PRINCIPLES

What Bear Goes Where? 79
Graphananimal 81
Urban Nature Search 83
Good Buddies 87
Forest In A Jar 91
Pond Succession 93
The Thicket Game 95
Adaptation Artistry 97
Seeing Is Believing. . .Or The Eyes Have It! 99
Surprise Terrarium 101
Polar Bears In Phoenix? 103
Quick Frozen Critters 105
Classroom Carrying Capacity 109
Muskox Maneuvers 111
How Many Bears Can Live In This Forest? 115
Visual Vocabulary 119
Rainfall And The Forest 121
Owl Pellets 125

SECTION FOUR: MANAGEMENT AND CONSERVATION

Wildwork 129
Oh Deer! 131
Here Today, Gone Tomorrow 135
Who Lives Here? 139
Planting Animals 141
Smokey The Bear Said What? 143
Checks And Balances 147
No Water Off A Duck's Back 151
The Hunter 153

SECTION FIVE: PEOPLE, CULTURE, AND WILDLIFE

Lobster In Your Lunchbox 159
First Impressions 161
And The Wolf Wore Shoes 163
Saturday Morning Wildlife Watching 165
Cartoons And Bumper Stickers 167
Does Wildlife Sell Cigarettes? 169
The Power Of A Song 171
Wildlife In National Symbols 175
Changing Attitudes 177

SECTION SIX: TRENDS, ISSUES, AND CONSEQUENCES

Learning To Look, Looking To See 181
Too Close For Comfort 185
Shrinking Habitat 187
Migration Barriers 191
To Zone Or Not To Zone 193
Deadly Links 197
Keeping Score 201
Planning For People And Wildlife 205

SECTION SEVEN: RESPONSIBLE HUMAN ACTIONS

Ethi-Thinking 209
Playing Lightly On The Earth 211
Water's Going On?! 213
What Did Your Lunch Cost Wildlife? 215
Flip The Switch For Wildlife 217
Ethi-Reasoning 219
Can Do! 223
Improving Wildlife Habitat In The Community 225
Enviro-Ethics 227

APPENDICES

List of Agencies and Organizations 230
Glossary 231
Activities by Grade 238
Activities by Subject 241
Cross Reference by Skills 244
Topic Index 248
Indoors or Outdoors 254
Conceptual Framework 255
Metric Conversion Chart 262
The Monday Group: From Awareness to Action 264
Project Evaluation 272
Acknowledgements 274
Code of Practice on Animals in Schools 277
Alphabetical Listing 279

AWARENESS D
APPRECIATIO

OH DEER!

Objectives

Students will be able to: 1) identify and describe food, water, and shelter as three essential components of habitat; 2) describe the importance of good habitat for animals; 3) define "limiting factors" and give examples; and 4) recognize that some fluctuations in wildlife populations are natural as ecological systems undergo a constant change.

Method

Students become "deer" and components of habitat in a highly-involving physical activity.

Background

A variety of factors affects the ability of wildlife to successfully reproduce and to maintain their populations over time. Disease, predator/prey relationships, varying impacts of weather conditions from season to season (e.g., early freezing, heavy snows, flooding, drought), accidents, environmental pollution, and habitat destruction and degradation are among these factors.

Some naturally-caused as well as culturally-induced limiting factors serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support. An excess of such limiting factors, however, leads to threatening, endangering, and eliminating whole species of animals.

The most fundamental of life's necessities for any animal are food, water, shelter, and space in a suitable arrangement. Without these essential components, animal cannot survive.

This activity is designed for students to learn that:

a) good habitat is the key to wildlife survival;
b) a population will continue to increase in size until some limiting factors are imposed;
c) limiting factors contribute to fluctuations in wildlife populations; and
d) nature is never in "balance," but is constantly changing.

Wildlife populations are not static. They continuously fluctuate in response to a variety of stimulating and limiting factors. We tend to speak of limiting factors as applying to a single species, although one factor may affect many species. Natural limiting factors, or those modeled after factors in natural systems, tend to maintain populations of species at levels within predictable ranges. This kind of "balance in nature" is not static, but is more like a teeter-totter than a balance. Some species fluctuate or cycle annually. Quail, for example, may start with a population of 100 pairs in early spring; grow to a population of 1200 birds by late spring; and decline slowly to a winter population of 100 pairs again. This cycle appears to be almost totally controlled by the habitat components of food, water, shelter, and space, which are also limiting factors. Habitat components are the most fundamental and thereby the most critical of limiting factors in most natural settings.

This activity is intended to be a simple but powerful way for students to grasp some basic concepts: that everything in natural systems is interrelated; that populations of organisms are continuously affected by elements of their environment; and that populations of animals do not stay at the same static number year after year in their environment, but rather are continually changing in a process of maintaining dynamic equilibria in natural systems. The major purpose of this activity is for students to understand the importance of suitable habitat as well as factors that may affect wildlife populations in constantly changing ecosystems.

Materials

area—either indoors or outdoors—large enough for students to run; e.g., playing field; chalkboard or flip chart; writing materials

Age: Grades 4—12
Subjects: Science, Math, Social Studies, Physical Education
Skills: application, comparing similarities and differences, description, discussion, generalization, graphing, kinesthetic concept development, observation, psychomotor development
Duration: 30—45 minutes
Group size: 15 and larger recommended
Setting: indoors or outdoors; large area for running needed
Conceptual Framework Reference: I.C.2., III.B., III.B.2., III.B.3., III.B.5., III.C., III.C.1., III.C.2., III.E., III.E.1., III.E.2., III.F., III.F.1., III.F.2., III.F.3., III.F.4., III.F.5., IV.C., IV.C.1., IV.C.2.
Key Vocabulary: habitat, limiting factors, predator, prey, population, balance of nature, ecosystem

Procedure

1. Begin by telling students that they are about to participate in an activity that emphasizes the most essential things that animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, and space in a suitable arrangement. This activity emphasizes three of those habitat components—food, water, and shelter—but the students should not forget the importance of the animals having sufficient space in which to live, and that all the components have to be in a suitable arrangement or the animals will die.

2. Ask your students to count off in four's. Have all the one's go to one area; all two's, three's, and four's go together to another area. Mark two parallel lines on the ground or floor ten to 20 yards apart. Have the one's line up behind one line; the rest of the students line up behind the other line.

3. The one's become "deer." All deer need good habitat in order to survive. Ask the students what the essential components of habitat are again: **food, water, shelter,** and **space in a suitable arrangement.** For the purposes of this activity, we will assume that the deer have enough space in which to live. We are emphasizing food, water, and shelter. The deer (the one's) need to find food, water, and shelter in order to survive. When a deer is looking for **food,** it should clamp its hands over its stomach. When it is looking for **water,** it puts its hands over its mouth. When it is looking for **shelter,** it holds its hands together over its head. A deer can choose to look for any one of its needs during each round or segment of the activity; **the deer cannot, however, change what it is looking for**; e.g., when it sees what is available, **during that round. It can change again what it is looking for in the next round, if it survives.**

4. The two's, three's, and four's are food, water, and shelter—components of habitat. Each student gets to choose at the beginning of each round which component he or she will be during that round. The students depict which component they are in the same way the deer show what they are looking for; that is, hands on stomach for food, etc.

5. The game starts with all players lined up on their respective lines (deer on one side; habitat components on the other side)—and **with their backs to the students at the other line.**

6. The facilitator or teacher begins the first round by asking all of the students to make their signs—each deer deciding what it is looking for, each habitat component deciding what it is. Give the students a few moments to get their hands in place—over stomachs, mouths, or over their heads. (As you look at the two lines of students, you will normally see a lot of variety—with some students water, some food, some shelter. As the game proceeds, sometimes the students confer with each other and all make the same sign. That's okay, although don't encourage it. For example, all the students in habitat might decide to be shelter. That could represent a drought year with no available food or water.)

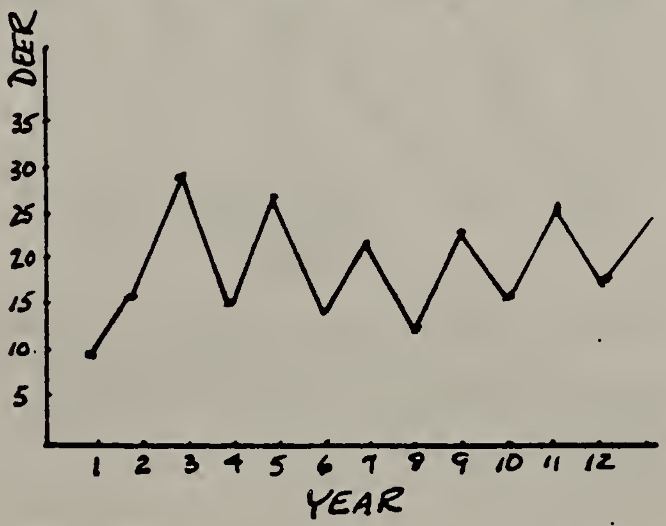
7. When you can see that the students are ready, count: "One . . . two . . . three." At the count of three, each deer and each habitat component turn to face the opposite group, continuing to hold their signs clearly.

8. When deer see the habitat component they need, they are to run to it. Each deer must hold the sign of what it is looking for until getting to the habitat component person with the same sign. Each deer that reaches its necessary habitat component takes the "food," "water," or "shelter" back to the deer side of the line. This is to represent the deer's successfully meeting its needs, and successfully reproducing as a result. Any deer that fails to find its food, water, or shelter dies and becomes part of the habitat. That is, in the next round, the deer that died is a habitat component and so is available as food, water, or shelter to the deer who are still alive. NOTE: When more than one deer reaches a habitat component, the student who gets there first survives. Habitat components stay in place on their line until a deer needs them. If no deer needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. The habitat person can, however, change which component it is from round to round.

9. You as the facilitator or teacher keep track of how many deer there are at the beginning of the game, and at the end of each round you record the number of deer also. Continue the game for approximately 15 rounds. Keep the pace brisk, and the students will thoroughly enjoy it.

10. At the end of the 15 rounds, gather the students together to discuss the activity. Encourage them to talk about what they experienced and saw. For example, they saw a small herd of deer (seven students in a class size of 28) begin by finding more than enough of its habitat needs. The population of deer expanded over two to three rounds of the game, until the habitat was depleted and there was not sufficient food, water, and shelter for all the members of the herd. At that point, deer starved or died of thirst or lack of shelter, and they returned as part of the habitat. Such things happen in nature also.

11. Using a flip chart pad or an available chalkboard, post the data recorded during the game. The number of deer at the beginning of the game and at the end of each round represent the number of deer in a series of years. That is, the beginning of the game is year one; each round is an additional year. Deer can be posted by five's for convenience. For example:



The students will see this visual reminder of what they experienced during the game: the deer population fluctuated over a period of years. This is a natural process, as long as the factors which limit the population do not become excessive, to the point where the animals cannot successfully reproduce. The wildlife populations will tend to peak, decline, and rebuild, peak, decline, and rebuild—as long as there is good habitat and sufficient numbers of animals to successfully reproduce.

12. In discussion, ask the students to summarize some of the things they have learned from this activity. What do animals need to survive? What are some of the "limiting factors" that affect their survival? Are wildlife populations static, or do they tend to fluctuate, as part of an overall "balance of nature?" Is nature ever really in "balance," or are ecological systems involved in a process of constant change?

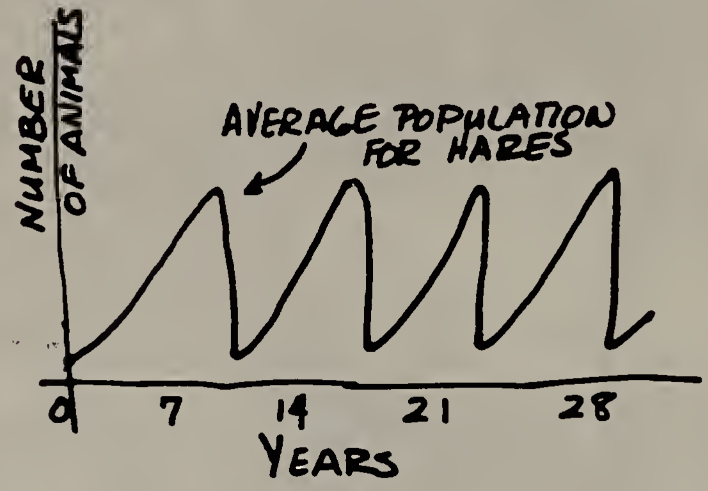
Extensions

1. When you have finished tabulating the graph data and discussing it, ask the students if they

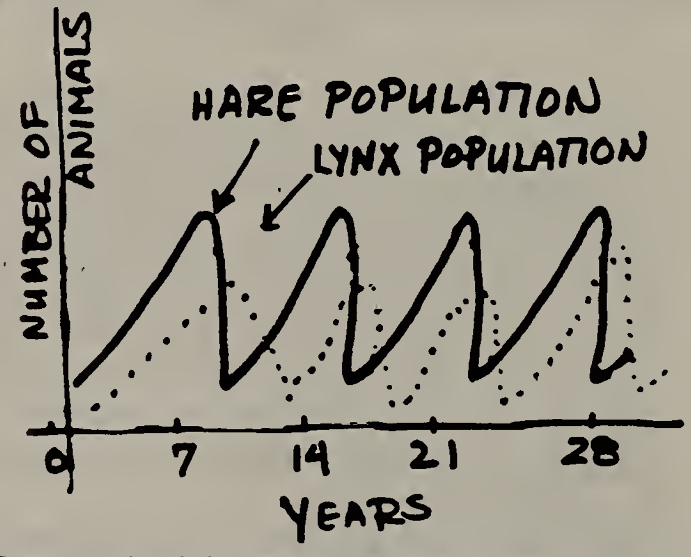
have ever heard of the Hudson Bay trappers in American history. Tell them, briefly, who they were.

There is a hundred years, or more, of records of the activities of these trappers. In those records are some interesting data. These data refer to pelts shipped from America to Europe, particularly the pelts of snowshoe hares and lynx.

Researchers have found that snowshoe hare populations seem to peak about every seven to nine years and then crash, repeating the process over each comparable time period. So, a snowshoe hare population graph would look like this:



It has also been discovered that lynx populations do the same thing—except that they do it one year behind the hare populations. The combined graph would look like this:



Graph this right over the deer graph that you made, adding first the hares, and then the lynx. Ask the students:

- Which animal is the predator? Which prey?
- Are predators controlling the prey, or are prey controlling the predators? (We have been brought up to "know" that predators control the prey—and are now discovering that this is not so. The number of prey animals available tells us how many predators can live in the area.)
- Is this like the deer habitat game we just played? Who controls? (Sometimes the habitat—when the deer population is not too large; sometimes the habitat—when the deer population "gets on top of it" and destroys the vegetative food and cover.)

2. Some recent research has added a new dimension to the story of the snowshoe hares and the lynx.

It has been found that a major winter food of the hare is a small willow. As hare populations grow, the use of the willow plants grows too. But, when the willow plant has been "hedged" or eaten back so far, the plant generates a toxin (poison) which precludes use by the hare. That is when the hare population crashes, followed by the crash of the lynx population about a year later. Then the willow, relieved of pressure, begins to grow again. The hare population begins to grow in response, and last of all, within a year or so, the lynx population follows. And the cycle has begun again—over and over—every seven to nine years.

Discuss the "balance of nature." Is it ever in "balance?"

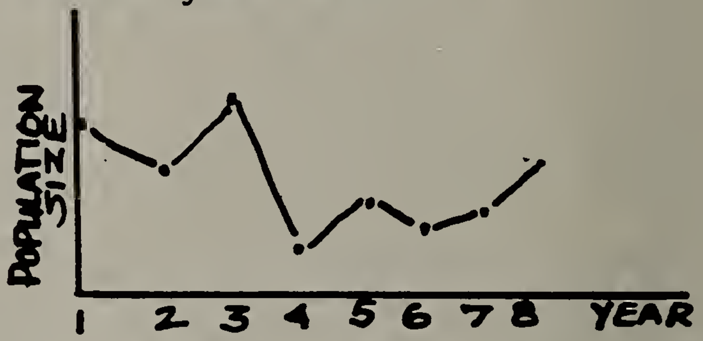
Evaluation

Name three essential components of habitat.

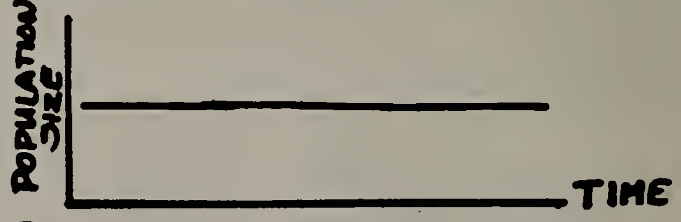
Define "limiting factors." Give three examples.

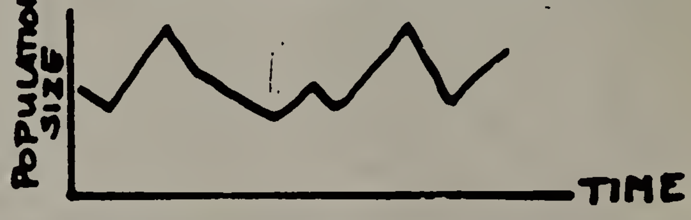
Examine the graph. What factors may have caused the following population changes:

a. between years 1 and 2?
b. between years 3 and 4?
c. between years 5 and 6?
d. between years 7 and 8?



Which of the following graphs represents the more typically balanced population?





URBAN NATURE SEARCH

Objective

Students will be able to generalize that each environment has characteristic life forms.

Method

Students go outside to observe an environment, using a questionnaire to assist in gathering data.

Background

Every environment has its characteristic life forms—including animals—and the urban setting is no exception. Many of these life forms have adjusted as their habitat has changed from undeveloped to urban. Not only have people altered the environment, the human environment has been shaped by the characteristics of the ecologies within which people live.

The major purpose of this activity is for students to recognize that all environments have characteristic life forms.

See "Wild Words' for a journal-making activity. Students can use their journals for this "Urban Nature Search."

Materials

questionnaires (designed by the teacher), pencils, notebooks or journals (See "Wild Words."), an outdoor setting to conduct this investigation

Procedure

1. Preview and select the route of the nature search. Note stopping places where students can observe and record information.

2. Design a questionnaire to be distributed to the students for use on the "search." The questions and tasks should encourage increased student observation. For example, many of the following phenomena can be designed into this activity:

Tally, describe, and sketch different kinds of plants growing on the north and south sides of buildings. (The differences may be due to temperature variations, sun and shade-loving species of plants, and less evaporation on the north side of building.)

Look for birds. Tally the numbers of different kinds of birds. If they are migratory, sketch the pattern of their flying formation!

Age: Grades 4—9 (and older)
Subjects: Science, Language Arts, Social Studies
Skills: analysis, application, classification, comparing similarities and differences, description, discussion, generalization, kinesthetic concept development, listing, observation, writing
Duration: 45 minutes to one-and-one-half hours
Group Size: any
Setting: outdoors and indoors
Conceptual Framework Reference: I.A.4., I.B., I.B.1., I.B.3., I.C., I.C.1., I.C.2., III.A., III.A.1., III.A.2., III.A.3., III.B., III.B.1., III.B.2., III.D., III.D.1., III.D.2., III.D.3., III.D.4., III.D.5., III.E.2., IV.C., IV.C.1., IV.C.2., IV.C.3., IV.E.5.
Key Vocabulary: investigation, observation, environment

Look for animals establishing "territory." Try to map the animals' territory. (During the mating season, birds can sometimes be seen choosing mates; males fighting, strutting, and dancing around the female species; and nest building.)

Look for evidence of predator/prey relationships. If any mammal, bird, or insect is seen—attempt to determine what animal is its predator or prey.

Record evidence of plant disease and insect damage. It is always interesting to see insect galls or bag worms in their natural setting.

Look for evidence of food chains. For example, if insects are observed, look for partially eaten, damaged or mutilated leaves. Then look for who eats the insects. Draw a food chain and identify the parts.

Try to observe a bee cross-pollinating flowers while gathering nectar for the production of honey. If you're fast, you can observe the specialized organs of the bee, and study them further (from diagrams and photos) back in the classroom.

Sketch trees and list their contributions to the community. (For example, trees can be observed breaking the velocity or speed of the wind. This can reduce wind erosion and might save energy by reducing the winter heat loss from homes in the surrounding area. Trees also serve as part of the wildlife habitat, increase the oxygen content of the air, and have aesthetic value.)

Who likes lichen? Predict what plants and animals have a direct or indirect relationship with lichens. (Lichens will be found growing on rocks, tree trunks, and even on soil. Lichens are really algae and fungi functioning as a partnership in a symbiotic association.)

Trace water's path in an area—like on one street, around one tree, down a hillside. (For example, draw the route of any visible erosion.) Look for results of freezing and thawing on sidewalks and buildings.

Find mulches around trees and shrubs. Record any evidence or observation of life forms. (These mulches allow the soil to absorb and retain large amounts of moisture and reduce evaporation. Mulches also reduce temperature extremes and contain earthworms, as well as microscopic and other life forms.)

Look for evidence of components of habitat. Students can observe first-hand the basic wildlife needs. Match animals with their habitat needs (food, water, shelter, and space in appropriate arrangement). It can be a real challenge for students to determine if all basic needs can be met in the available habitat. Predict what animals should be able to live in the habitats identified.

3. On the field trip, each student should bring a copy of the questionnaire and a pencil and notebook or journal. Remind students not to disturb or destroy any plants or animals they may see.

4. What "characteristic life forms" did the students find that were most surprising? Involve the students in a discussion of their observations, their techniques, and their conclusions. Encourage the generalization, warranted by the results of their investigation, that each environment has characteristic life forms.

Extension

Chart the characteristic life forms found on the search, according to the environments in which they were found. For each animal listed, identify how its basic needs are met. Describe any animal adaptations that seem well-suited to survival in the urban environment. Note any interdependencies between plants and animals, plants and plants, animals and animals. Discuss ways in which people have altered the natural environment and ways in which natural forces have shaped the human environment.

Evaluation

List ten types of plants you might see around the school.

List ten types of animals you might see around the school.

Select any four animals you might see around the school—and describe how these animals find food, shelter, and water in order to survive in the school community. If these animals were not living around people, how might the ways they meet their needs be changed?

URBAN NATURE SEARCH

Tally, describe, and sketch three plants you find on or near a building:

Indicate whether the plants are on the north, south, east, or west side of the building. Sketch and describe any differences in the kind of vegetation you find on each side of any building.

Tally and sketch any kinds of wildlife you observe. Identify and map the available food, water, shelter, and space for three or more kinds of wildlife you observe in the community. Look for evidence of food chains. Draw three food chains based on your observations of the urban environment and its wildlife and identify the parts.

Trace water's path. Map it. Include illustrations of direct and indirect relationships between wildlife, vegetation, and water in the area of the community you are observing.

WHAT'S FOR DINNER?

Objective

Students will be able to generalize that all animals, including people, depend on plants as a food source, either directly or indirectly.

Method

Students list and analyze the sources of foods.

Background

Plants ultimately support all forms of animal life, including people, either directly or indirectly. Most people are omnivores, which means that they eat both plants and animals in some form. Some people include a lot of meat in their diets, others much less, and some people none at all. It is easy to see that people who are vegetarians—who eat only plants and plant products—are supported directly by plants. It may not be as easy for children to see that even when they are eating animal products, they are indirectly relying on plant sources. For example, cows from which milk and other products are derived, and chickens which provide eggs and meat, are animals which depend upon plants for some or all of their food. Every animal, including people, either eats plants directly—or depends for food upon other species which in turn depend upon plants.

The primary purpose of this activity is for students to trace human and other animals' dependence upon plants for food.

Materials

writing materials, chalkboard; poster board and drawing materials optional

Procedure

1. What's for dinner? Ask students to go home and make a list of everything that they have for dinner on a particular evening—perhaps with help from a parent, brother, or sister.
2. In the classroom, ask the students to work alone or in groups to analyze where their food comes from. Every food should be traced back to a plant. As each item on a menu is examined, ask the students to create a flow diagram or chain which shows the major sources of each food—from the product they eat all the way back to the plant origin. For example: Me Milk Cow Grass. Some chains will be short; others will be long. Sometimes the students may not be sure what particular animals eat for food, so they will want to ask or do some library research to find out.
3. Have a general discussion with the students: "What are some of the things you have learned from this activity?" After the students have described things they have learned, encourage them to make two generalizations about plants and animals: 1) all animals, including people and wildlife, need food; and 2) all animals, including people and wildlife, depend upon plants for food. (Watch for the insight that ultimately plants need animals, too! The decay of animal life after death into nutrients in the soil provides sustenance to plants as well!)

Age: Grades 3—7 (and older)
Subjects: Science, Language Arts, Health
Skills: analysis, classification, discussion, drawing, listing, media construction, writing
Duration: 20 minutes or longer
Group Size: any
Setting: indoors
Conceptual Framework Reference: I.A., I.A.1., I.A.3.
Key Vocabulary: food chain, plants, animals

Extensions

1. Create posters of the menus showing the food chains involved in each. Add soil, water, sun, and air—since these are necessary to plants, people, and all animals too!

2. Create a master list of all the plants that were identified. Look to see which plants we seem to depend upon more than others. Some students might be interested to know that other groups of people—like people in other parts of the world who live in different environments—could come up with a very different list of plants upon which they depend.

3. Adopt a rock! Did you know that everything you ate for breakfast (lunch, dinner, or a snack!) started somewhere with a rock! Trace plants to soil, and soil to its parent matter—including rocks!

Evaluation

Using the organisms listed below, construct at least three food chains: people, rabbits, grass, lettuce, mountain lions, robins, earthworms, hawks, mice, insects, wheat, cows, corn, pigs, deer, acorns.

Which of these animals do not need food? horse, snake, frog, people, robin.

All of the food eaten by animals must first come from ______________________________ ?
(Although the objective of this activity stressed that animals rely on plants, please accept any reasonable response—like soil, sunlight.)

PUDDLE WONDERS!

Objectives

For Younger Students

Students will be able to: 1) predict where puddles will form and how they will change; and 2) observe and describe organisms that live in or near puddles.

For Older Students

Students will be able to: 1) predict where puddles will form and how they will change; 2) observe and describe organisms that live in or near puddles; 3) measure and record the amount of water in puddles; and 4) make inferences about what types of organisms occupy puddles.

NOTE: This activity should be conducted at a time of year when rainfall is likely, if possible. Ideally, students investigate school grounds **before** and **after** a rainstorm. In arid areas, puddles may be created with buckets or water hoses.

Method

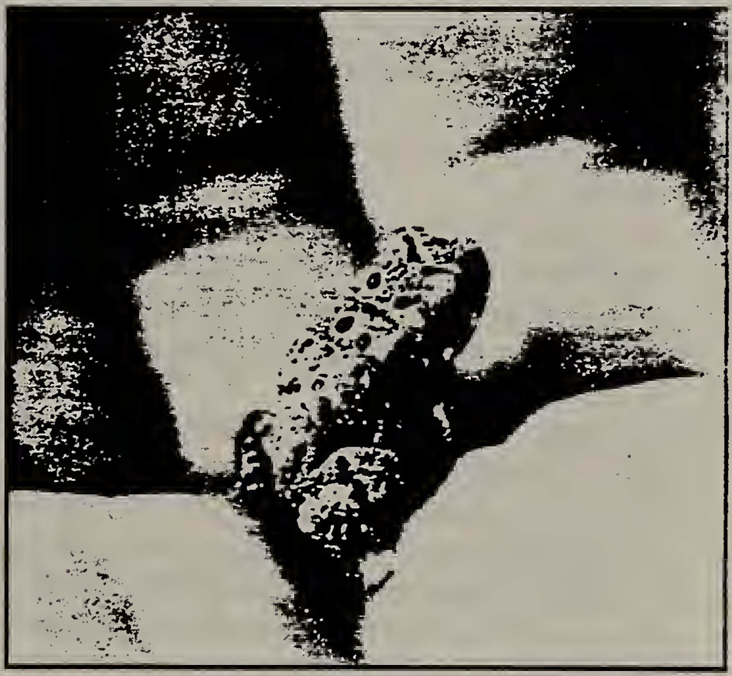
Students will observe water that accumulates in puddles on or near the school grounds as well as any associated wildlife. Older students also measure the depth, area, and volume of the puddle.

Background

Water flows downhill and for a variety of reasons it sometimes stops flowing. When this happens a puddle, pond, lake, or inland sea is formed. Puddles form in low spots or depressions in the land's surface. Water gathers in depressions until the holding basin is filled to capacity. Then the water flows out on the downhill side. Depending on the size of the puddle, water may be trapped for some time. If the puddle lasts for several days, there is a strong possibility it will be visited by wildlife.

Many animals take advantage of temporary puddles and ponds to reproduce, thus completing the animals' life cycle.

As an example, one of the most amazing life histories is that of the spadefoot toad. Spadefoots spend most of their adult life underground. They emerge at night to feed on insects and other invertebrates during warm weather. In extreme cold or hot weather these toads stay hidden.



Age: Grades 2—12
Subjects: Science, Math (for older students)
Skills: analysis, classification, comparing similarities and differences, computation (older students), description, discussion, drawing (younger students), estimation (older students), identification, inference, interpretation, listing, mapping (older students), measuring (older students), observation, prediction, psychomotor development, reporting (older students), small group work, synthesis, using time and space, writing (older students)
Duration: two or three 20-45 minute class periods
Group Size: small groups of three to five
Setting: outdoors and indoors
Conceptual Framework Reference: I.A., I.A.1., I.A.2., I.A.4., I.B., I.B.1., I.B.2., I.B.3., I.B.4., I.C., I.C.1., I.C.2., I.C.3., I.C.4., I.D.
Key Vocabulary: puddle, wildlife; for older students: area, depth, volume

Immediately after the first heavy rains of summer, spadefoots emerge to mate. The female lays between 300 and 500 eggs in temporary puddles and ponds. The male goes into the puddle or pond and externally fertilizes the eggs. The eggs hatch and the tadpoles complete their development in 10 to 12 days—hopefully completing their growth before the water dries up!

Many other toads and salamanders also use temporary puddles and ponds for their reproduction. What advantage could a temporary pond have over a permanent pond? One favored theory is that temporary ponds have no fish to prey on the eggs or tadpoles. Freshwater shrimp such as fairy shrimp and tadpole shrimp also utilize temporary puddles and ponds to reproduce. One-celled animals, aquatic insects, and other invertebrates also use puddles for reproduction.

Many species of flying insects such as butterflies, wasps, and flies visit puddles and appear to "suck" from the mud at the puddle's edge. They are getting vital salts and other minerals from the mud.

Some animals may visit puddles for mud-building materials for nests; e.g., some species of swallows and mud-dauber wasps.

Other animals may visit the puddle to bathe or drink.

Studying ponds and lakes and the life forms found in and around them is a primary concern to many aquatic biologists. Some of the techniques these biologists use can also be duplicated by students examining schoolyard puddles. Size, depth, circumference, cause of accumulation and the identity of transient animal life can be determined by simple observations and measurements.

The major purpose of this activity is to increase the students' appreciation of the value of something as apparently humble as a schoolyard puddle!

Materials

For Younger Students: no materials needed

For Older Students: pencils; data sheets; measuring instruments (rulers, yardsticks, tape measures); string (for use in making measurements)

Procedure

1. Begin with a discussion about rainfall and runoff. Where does the water come from? Where does the water go? When water ceases to run off a surface, a puddle forms. Tell the students that the class will make a study of the smallest body formed as water flows across the land—the puddle! If necessary in drier climates, a few puddles could be created by using buckets or a hose.

2. **For Younger Students:** Divide the students into small groups of three to five. **Before a storm**, take them to different areas of the school grounds. Have them try to guess where they think puddles will form. Have them guess what wildlife might use the puddles when the rains come. For what purposes? If the school ground is paved, have them draw chalk outlines to show where they think the puddles will be.

OPTIONAL: Have them draw pictures on paper to show where they think the puddles will be.

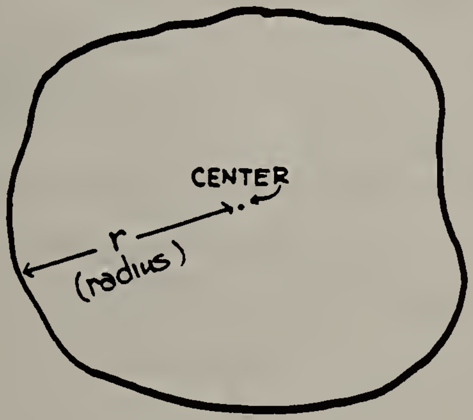
For Older Students: Divide the students into teams of three to five members. Send the teams outside on the school grounds to make observations and predictions about where puddles will form in a rain storm. Have each team of students prepare a map of the school, showing the location of the predicted puddles. Also have the students make a comprehensive list of all the forms of wildlife that can be seen on the school site. Look for birds, insects, rodents, worms, mammals, and reptiles, etc. Ask the students to look beyond **direct** observation and also find **indirect** evidence of wildlife, like tracks, droppings (scat), slug trails, feathers, ant hills, etc. Keep these maps and wildlife lists for later use following the storm.

3. **For Younger Students:** After the next rainy period, take them outside to take an inventory of puddles on the school grounds. Were they

right? Did puddles form where they had guessed they would? If the puddle areas overflowed, have them trace where the "extra" water went. If they made drawings before, they can add pictures of where the puddles actually formed and compare.

For Older Students: After a storm, when there are puddles on the school grounds, send the teams outside again. They should again map the school grounds, this time locating the actual position and gross dimensions of the puddles on their maps. They should also find the area of one or more puddles.

To determine the area of a puddle:



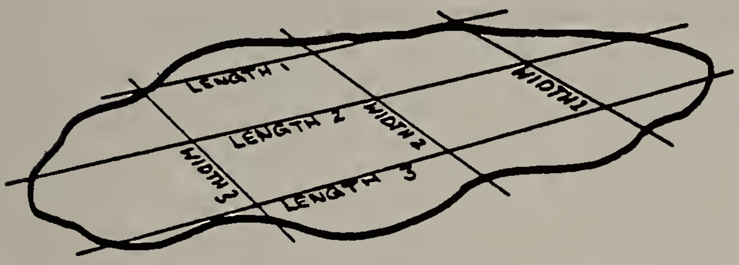
Round Puddles

$\text{Area} = \pi r^2$

($\pi = 3.14$; it is a mathematical constant)

$A = 3.14 \times r \times r =$

$\text{Area} = \text{Length (average)} \times \text{Width (average)}$



$\text{Average Length (La)} = \dfrac{L1 + L2 + L3}{3}$

(3 is the number of measurements)

$\text{Average Width (Wa)} = \dfrac{W1 + W2 + W3}{3}$

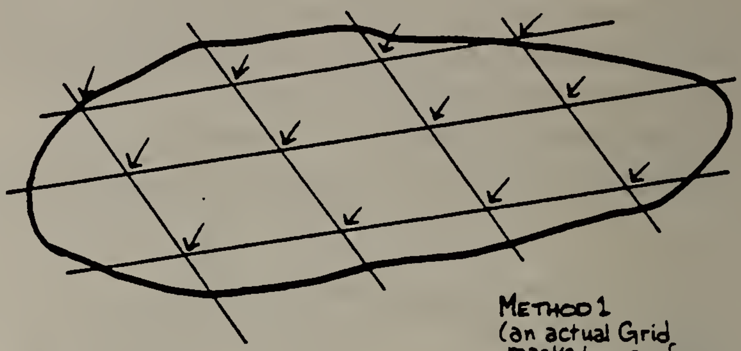
$A = La \times Wa$

The teams should also determine the volume of water in one or more puddles. Before that number can be calculated, the average depth of the puddle must be measured. There are many ways to determine the average depth. Either of two methods shown below can be used:

METHOD 1

1) Establish a grid on the surface of the puddle. (Lengths of string tied to rocks or nails pushed into the soil anchor the strings.)

2) Measure the depth at every place the strings cross. (See the small arrows on the drawing.)

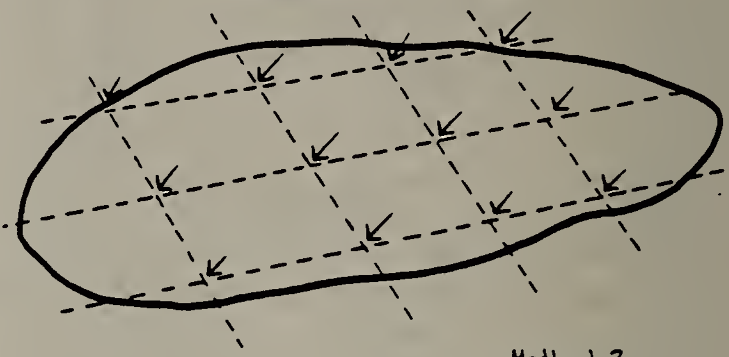


METHOD 1
(an actual Grid marked on surfaces at the puddles edge)

METHOD 2

1) Imagine a grid on the surface of the puddle.

2) Measure the depth every place the imaginary lines come together.



Method 2
(an imaginary grid)

Use the following formula for average depth (Da). There are ten measurements of depth shown in the example above.

$$\text{Da(average)} = \frac{D1 + D2 + D3 + D4 + D5 + D6 + D7 + D8 + D9 + D10}{10 \text{ (the number of measurements)}}$$

Now the volume can be calculated: Volume = La x Wa x Da

4. **For Younger Students:** Still outside on the school grounds. look for any signs of wildlife in or near the puddles. Make a simple list of kinds of wildlife and tally the numbers of each. or evidence of each. that the students observe. If possible. have each small group of students make their own list. OPTIONAL: If a puddle is on blacktop. you can sprinkle a fine dust of cooking flour around the puddle so that tracks can be seen. Put the flour in a salt shaker to sprinkle it. Record the time of day when the flour is sprinkled. During the day—recess. etc.—encourage the students to notice if there are any changes. Are there bird tracks? Signs of insects? Tracks of mammals? You and the students can also keep a record of how long the puddles last. One day? Two days? A week? Longer? Which puddle is the first to disappear? Why? Which puddle is the last to disappear? Why?

For Older Students: Once all the measurements have been taken for each puddle—or during the same period of time while at a puddle—the team should also make observations about wildlife. Each team should list any species of animal for which they have direct or indirect evidence of using the puddle in some way. Ask them to organize their observations in a written form. For example. they could list:

Species
Evidence
Apparent Uses of Puddle by Species
Estimated Number of Animals of this Kind Using the Puddle

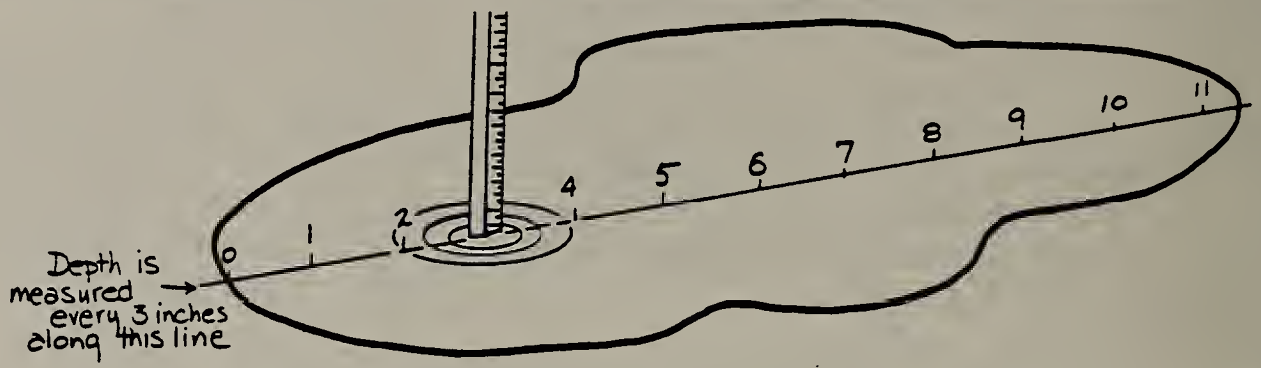
5. **For Younger Students:** Back in the classroom ask the students what they have learned about puddles. Are they important? If yes. what is important about puddles? If no. explain why. Talk about puddles and wildlife as part of the discussion. After the students have offered some of their observations in informal discussion. ask each student or small group of students to name one word or idea about puddles. List all the words on a chalkboard for everyone to see. OPTIONAL: Ask the students to write a poem using some or all of the words: arrange the words in the shape of a puddle; or draw a picture about puddles and wildlife. including some or all of the words.

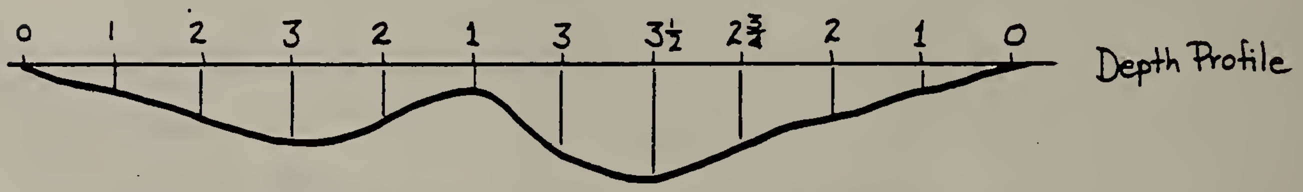
For Older Students: Back in the classroom ask each team to report. Discuss their findings. Compare similarities and differences in the teams' findings. Ask the teams to compare their early predictions about the puddles and wildlife with their actual findings. After all the reports are finished. ask each team to make a summary

statement of one minute or less reflecting the inherently fascinating nature of the under-appreciated puddle!

Extensions

1. Keep a record of these areas of accumulation over the seasons. What similarities occur, what differences? Ask the students to calculate how much water is "caught" each year by the puddle they studied.
2. Find relatively permanent puddles (small ponds) and carry out the same observations as those done with the playground puddles.
3. Biologists sometimes need to know what the underwater surface of a pond is like. They want to find out where the pond is shallow and where it is deep. They use the same gridwork approach used in the procedures, above. The difference is that they keep a record of the change in depth along a straight line. See the drawing below:





When you do this on all the lines, you can get a good approximation of the shape of the puddle bottom.

4. Repeat this "Puddle Wonders" activity using metric measurements.

Evaluation

For Younger Students

Describe or draw three animals using puddles. How and why do these animals use puddles?

For Older Students

What common characteristics are shared by animals that use puddles? How would you determine the amount of water in a puddle?

WATER WINGS

Objectives

Students will be able to: 1) illustrate the water cycle; 2) describe the interrelatedness of the world's waters; and 3) state the importance of water to people, plants, and animals.

Method

Students experience a guided imagery and then create artwork and poetry.

Background

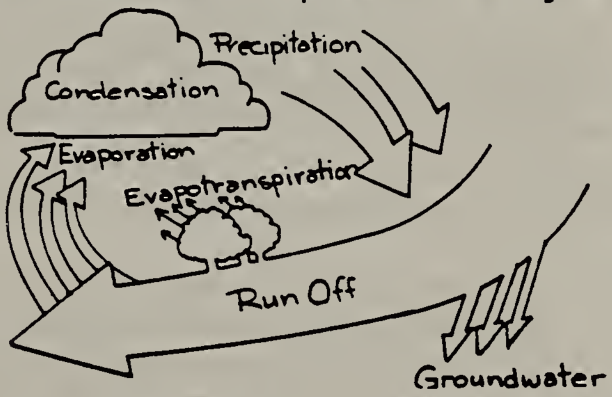
There is, in a sense, one body of water on planet Earth. Its rivers reach in sinuous paths out from the hearts of every continent. All water, everywhere, is somehow connected. Everyone can rather easily see and sometimes physically touch this universal body of water in some form—perhaps by turning on a water faucet or by looking at clouds moving high in the sky. Lakes, ponds, and inland seas are webbed together by waters flowing across the surface of the land or in the seeping flow of groundwater. Through evaporation, condensation, and precipitation, the atmosphere transports water from place to place.

Plants also are an active part of the water cycle in many ways—including by transpiration. Transpiration is a process whereby plants evaporate moisture through the surfaces of their leaves.

People seldom think of the waters of the world as being connected into one body. Maps emphasize the continents and political boundaries on land. Geographers have named dozens of seas which in reality cannot be delineated from each other—similar to the way that territorial boundaries on land tend to be more political than geographical.

Human beings are linked to the planet's watery world. Our bodies are approximately 75% water. Each molecule within us has been part of the oceanic realm in times past. Molecules of our bodies' water may have flowed in streams, lofted in air or been locked in glacial ice. Other animals and plants are also tied to the planet's waters—directly and indirectly. Living things are partly made of water; all life depends upon water in some way.

The continuous dynamic of the movement of water is called the water cycle. The concept of the water cycle is a way to view the moving connectedness of water in its many forms. Here is one illustration of the concept of the water cycle:



The major purpose of this activity is for students to increase their understanding of the unified nature of all the earth's waters.

Materials

tape recorded music, water sounds, or "ecosystem" recordings of an aquatic habitat; art materials (water-based paints such as acrylics, water color, or poster paints; brushes, paper, containers for water); writing materials

Age: Grades 5—9
Subjects: Science, Art, Language Arts
Skills: analysis, communication, description, discussion, drawing, generalization, inference, interpretation, kinesthetic concept development, listening, mapping, observation, synthesis, visualization, writing
Duration: one or two 30-60 minute periods
Group Size: any
Setting: outdoors and indoors; outdoors for first part of activity if appropriate site is available
Conceptual Framework Reference: I.A., I.A.1., I.A.2., I.B., I.C., I.C.1., I.C.2., I.C.3., III.A., III.B., III.B.1., IV.B., IV.C.
Key Vocabulary: water cycle, planet, ocean, precipitation, condensation, evaporation, transpiration, groundwater, watershed

Procedure

1. OPTIONAL: If at all possible, the students should visit a real stream, pond, lake, river, or beach. Try to choose one where human-made sounds are at a minimum. If possible and not dangerous, allow the students to touch the water during the part of this activity where they are being led through a guided imagery. Consider the possibility of taking battery-operated tape recorders on the field trip to tape some of the natural sounds the students experience for later playing once the students are back in the classroom.

2. OPTIONAL: If the field trip is not possible, then try to use a tape player with recordings of natural ecosystems: the sounds of oceans, rivers, streams, swamps, or brooks are often available on tape from bookstores, music stores, and shops that specialize in nature. Classical music can be substituted. "La Mer," "The Pines," and "Fountains of Rome" are examples. Any of a number of selections of "new age" music are also excellent. You can also make your own tape recordings.

3. Ask the students to sit or rest quietly in a comfortable position. Begin the guided imagery. OPTIONAL: If available, invite the students to relax and listen carefully to the water and/or musical sounds. These sounds are simply background for the ideas you are going to ask them to visualize in their minds.

NOTE: Please modify the water images in the text of this guided imagery as needed to adapt to your location. Also you may want to read the section about guided imagery that appears in the appendices to this activity guide for additional suggestions concerning use of this instructional strategy with students.

"You are to try to imagine the things you will hear me describing. Sit comfortably and close your eyes. . . Relax, and do your best to imagine what I am describing. . . You are sitting on the edge of a stream (lake, ocean, etc.). . . Your bare feet are swinging in clean, clear water. . . The water feels good, but it is cool. . . You feel a current washing over your feet, pulling at them. . . Think about the water flowing past your feet until it reaches a larger stream. . . The water connects you with the larger stream. . . Feel its more powerful flow. . . See the green ribbon of trees and plant life on the banks. . . The larger stream carries the water past flat farmlands, cities, factories, and forests until it eventually reaches the sea. . . Through your feet and the continuous currents of water you can imagine that you feel the sea. . . Now stretch your mind and realize that you interconnect with all the world's oceans. . . You are now touching one single body of water that stretches all around the world. . . Your own body contains water that is part of this system. . . Your touch laps against the shores of the Pacific Ocean, it flows under the Golden Gate bridge in San Francisco's bay, it leaps and plunges around oil drilling platforms in the North Atlantic. . . It pours from the sky as a storm rages dark and gray. . . It drenches an Alaskan native who shivers on the Arctic shores before her parka begins to warm her. . . It glistens on the back of a Greek boy who tugs fiercely on fishing nets in the warm Mediterranean Sea. . . Water connects your feet with every stream flowing into the oceans around the world. . . You can reach up the rivers to the hearts of continents. . . You can feel the tremor of the hippopotamus that just dove into an African river. . . You can feel an alligator silently sliding toward a heron in the Florida Everglades. . . You can feel beavers busily building a dam on a stream in Europe. . . You can see water, thousands of tons of it, in great drifting fleets of heavy white clouds. . . Your reach embraces all the whales, all the porpoises, all the sharks. . . You are connected with the mythic creatures, living only in the minds of people in the past—mermaids, citizens of Atlantis, and the mythic monsters that swim in Loch Ness. . . Your feet feel the flow of the current of the miles-wide Amazon River in South America, the ancient Nile River pushing north through Africa, the Colorado River thundering with a boatful of river rafters through the Grand Canyon. . . Your watery embrace wraps all around the Earth. . . And, of course, the water flowing over your feet connects you with everyone else who is now sitting, with feet dangling in a stream, wondering where the water goes. . . It is time to come back. . . Bring the limits of your senses back from the world's rivers and oceans. . . back to the surfaces of your feet. . . back to where you are. . . When you feel ready, you may open your eyes."

4. Once the imagery is complete, ask the students to open their eyes. Tell them that they each had their own private journey even though they all heard the same words. Tell them that in a moment you will ask them to close their eyes again to find one place on the journey through the world's waters that was their favorite—and you will ask them to try to remember what that image was like.

5. Ask them to relax again and have them try to re-create the picture in their minds. Tell them to look at the detail, the colors, the plants and animals, and to try to capture it all in one scene. Have them pay particular attention to the role of water in the lives of people, plants, and animals.

6. When you feel they have had enough time, ask them to open their eyes. Provide the art materials and ask them to each get paint sets and paper and to quietly paint the image of their favorite place. OPTIONAL: You may provide an opportunity at this time for some or all of the students to talk briefly about their favorite places.

NOTE: If you choose the field trip instead of the classroom option, try to take water-based paints to the field so the actual water of the site can be used to paint the images. If you remain in the classroom, you might mention how some of the waters of their journey will now be used to help them paint their image.

7. Once the images are complete, ask the students to write various short forms of poetry that express some of their feelings about water and its importance. Here are a few examples of poetic forms which can be used.

Haiku Haiku, originated by the Japanese, consists of three lines of five, seven, and five syllables each. The emphasis is syllabic, not rhyming. For example:

The fish swam by me
Nothing left in the shimmer
My heart beat faster

Cinquain Cinquain is derived from the French and Spanish words for five. This form of poetry is also based on syllables—or may be based on number of words—but there are five lines. Each line has a mandatory purpose and number of syllables or words. These are: 1) the title in two syllables (or two words); 2) a description of the title in four syllables (or words); 3) a description of action in six syllables (or words); 4) a description of a feeling in eight syllables (or words); and 5) another word for the title in two syllables (or words). Here are two examples, the first using syllables and the second using words.

Osprey
Fishing eagle
Moves above dark water
With graceful strength it finds its meal
Seeker

Sea otter
Mammal of living waters
Swimming, sleeping, eating,
diving, basking, playing
Sensitive indicator of the quality
of continuing life
Still here

Diamante Diamante is a poem shaped in the form of a diamond. It can be used to show that words are related through shades of meaning from one extreme to an opposite extreme, following a pattern of parts of speech like this:

noun
adjective adjective
participle participle participle
noun noun noun noun
participle participle participle
adjective adjective
noun

For example:

Stream
Small, clear
Rippling, moving, growing
Life, plants, animals, people
Rushing, sustaining, cleansing
Connected, universal
Ocean

Free verse Free verse is poetry in which the author is free to invent its form. It may or may not rhyme. For example:

Waterstrider

I watch you stand on glass

that bursts apart to my gentlest touch.

You dash, you dart, and exhaust the eyes

that try to follow.

I think you are teaching me something

I will know

on some day like this—

but in a time long after

you are gone.

8. OPTIONAL: Display the images and poetry in a circle around a world map. With yarn, connect the images that the students painted of their favorite places to the sites where they appear on the map.
9. Discuss the "one body of water" metaphor. Emphasize the concept that all the waters of the world are interrelated and connected. Help the students see that the air is part of that connection too. It is the air that carries the waters back to the rivers from the sea. Point out that watersheds are the places where the air rains its water back down on the earth's surface and it accumulates. Talk about the importance of water to people, plants, and animals.
10. End the activity with a description of the water cycle. Ask the students to describe how their favorite place, which they illustrated in their painting, is a part of the water cycle. You might want to point out that the water they used in their paintings has evaporated from the pictures and is back in the water cycle again!

Extensions

1. Find out the annual rainfall and climate in the area you chose to paint.
2. Write a statement or poem about planetary pollution of water and attach it to the art. Write a second statement or poem about what can be done to keep the earth's waters healthy and free of pollution.
3. Trace the migratory path of a salmon, tuna, or whale and describe the qualities of the different water environments that the animal experiences.
4. Choose a freshwater body of water near you and trace its path to the sea.

Evaluation

Describe the water cycle. Illustrate your description.

Describe how all of the earth's water is connected and interrelated.

List at least ten ways that you use water every day.

List as many examples as you can of why water is important to plants and animals.

HINTS FOR USING GUIDED IMAGERY

Guided imagery is a powerful way for students to create vivid experiences in their mind's eye. Many older people remember when the major form of entertainment was radio. With radio and its absence of visual images, many listeners were forced to create mental pictures of the way various characters looked and acted. It was common for listeners to see landscapes, cities, and any number of exotic settings. Often one hears teachers and parents claim that radio helped make students more creative as it required the listeners to stretch their imaginations. Many neuroscientists concur.

Research has shown that, with their eyes closed, people activate parts of their brain-mind systems that are left unstimulated without imagery. That is, imagery usually calls specific parts of the brain into activity that are unused in reading or writing. Studies show that imagery enhances a person's ability to enrich reading and to increase skill and imagination in writing. Use of imagery enhances a person's capacity to remember concepts, words, names, and ideas. Dramatic results have been achieved when imagery is combined with medicine. In many instances, life-threatening illnesses have been reversed and overcome.

The use of guided imagery for instructional purposes is promising to become one of the most effective educational strategies of the past two decades. The following guidelines provide a basic, useful approach to the use of guided imagery as a teaching tool.

Steps Toward Effective Use of Guided Imagery

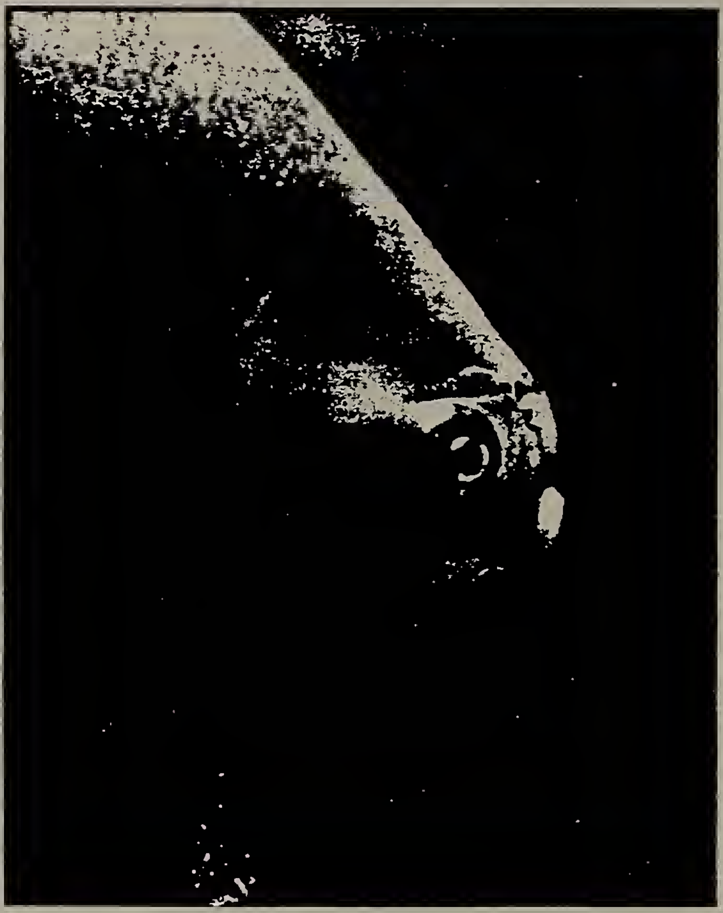
1. Ask the students to lay aside all pens, pencils, books, etc.
2. Instruct the students to sit in a comfortable and relaxed position with their eyes closed.
3. Wait until you see a general state of relaxation before beginning.
4. Using a steady and paced reading or speaking style, begin offering the students the narrative. Remember to speak slowly and steadily. If you want the students to create rich mental images, you must allow them time to do so. It takes about as much time to observe mental images as it does to carefully review actual physical settings.
5. Once the narrative is finished, invite the students to review all of the images they saw in their minds. Again, try to allow enough time for an adequate visual review—and remember, the review takes time.
6. After an adequate time for mental review (at least one minute and possibly two minutes), ask the students to open their eyes.
7. Begin discussing the imagery in terms of the instructional purpose for its use.

In some cases, the imagery serves simply to provide a visual review of some of the students' past experiences. At other times, you are providing stimuli for the students to create original images. In any case, it is important to realize that there are no mistakes in mental images. What a student imagines is real. The images are data. If students create images that are inconsistent with what you expected, consider the images to represent differing perspectives rather than wrong answers. Try to honor and nourish variety as a means to add richness to the topics being explored.

In addition to serving as a powerful and effective way to explore and remember concepts, regular use of guided imagery also tends to relax students. When relaxed, they will frequently be more productive in all academic areas—including scoring higher on standardized achievement tests.

Guided imagery is used in several Project WILD Aquatic Education Activities: "Water Wings," "Riparian Retreat," and "Alice in Waterland." It is also used in the Project WILD Elementary and Secondary Guide Activity, "Stormy Weather."

USING SIMULATIONS FOR INSTRUCTIONAL PURPOSES



There are several simulation activities in the *Project WILD Aquatic Education Activity Guide*. "Hooks and Ladders," a Pacific salmon simulation, and "Turtle Hurdles," a marine turtle activity, are examples. In conducting simulations for instructional purposes, it is important to remember that the activity can take on a life of its own. The students can get so involved in the role they are playing that they forget to relate the objects, events, and processes to what they represent in nature.

Students of all ages may tend to get competitive when they are responsible for capturing or escaping the various animals depicted in the activity. Often antic and energetic physical behavior results. During such activity, the students identify subjectively with the role they are playing. This identification is important and should be encouraged as part of the powerful learning that is possible through simulations. Yet it is also important to link the subjective experience with the objective concepts that are central to each activity.

Distinguish between what is realistic and what is not realistic about the simulation. Simulations, by definition, are simple representations of more complex natural interactions. Teachers should point this out to students and help them understand how the simulation is like and not like the real situation. Simulations always leave out some elements that exist in nature. They simplify in order to make a point. Make sure that the students are clear about the point.

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